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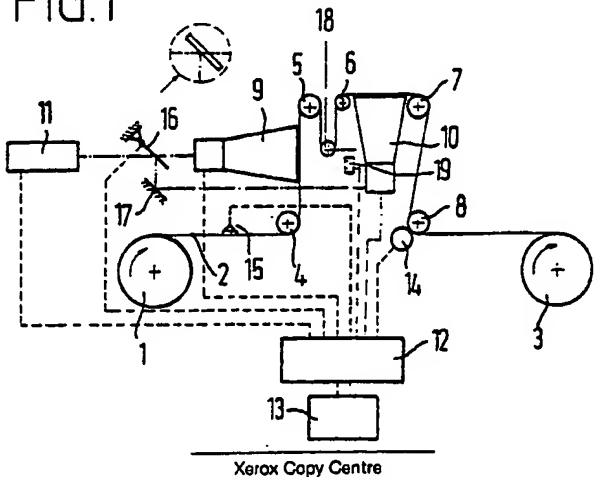
(54) A method of providing score lines in packaging material.

(57) A method of providing score lines in packaging material (2) by local evaporation by means of a laser beam (9, 10), the laser beam (9, 10) and the packaging material (2) being relatively movable. The score lines are provided in a recurring pattern on at least one side of a web of packaging material advancing at uniform, adjustable speed. The intensity of the laser beam is adjustable and the laser beam is moved in two mutually perpendicular directions under the control (12) of pattern-dependent signals.

FIG.1



EP 0 357 841 A1

A method of providing score lines in packaging material

This invention relates to a method of providing score lines in packaging material by local evaporation by means of a laser beam, said laser beam and packaging material being relatively movable. This method is known from GB-A-2,161,427.

The provision of score lines in suitable places in containers contributes largely to the consumer-friendliness of a container in that

- the container can be opened easily without using special tools such as scissors, knives, nails and teeth,
- the dosability of the contents after opening the container, is considerably improved because an opening of the desired configuration is produced instead of a randomly extending tear;
- the aesthetical appearance after opening is improved.

The score lines themselves should comply with the following requirements:

- the packaging material, after provision of the score line, may not tear during further treatment, such as filling, transport, storage,
- the container should continue to comply with predetermined transmission values, i.e. the contents may not lose aroma, smell, taste and the like or there may be no ingress of water vapour, oxygen and the like into the contents through the score lines.

In the method disclosed in GB-A-2,161,427, sheets to be folded to a container are provided with score or fold lines by means of a laser beam, the configuration of said lines corresponding with a mask placeable on the sheet. The sheets are placed one by one underneath the laser beam and, after provision of the score lines, are removed. This method is insufficiently efficient for application on an industrial scale and in particular too slow.

The provision of score lines by means of a laser beam in an advancing web of packaging material is known from USP 3,909,582. In that arrangement, the laser beam is stationary and the score line extends in the direction of advance of the web of packaging material. By imparting to the laser source a reciprocating movement transverse to the direction of advance of the web, the score line can acquire an approximately sinusoidal configuration, as described in USP 4,549,063.

It is an object of the present invention to provide a method of forming score lines of any given configuration in packaging material at a high rate. This method is characterized, according to the present invention, in that the score lines are provided according to a recurring pattern on at least one side of a web of packaging material advancing at uniform, adjustable speed, said laser beam being adjustable as regards intensity and being moved in two mutually perpendicular directions under the control of pattern-dependent signals.

By packaging material are understood both single materials and multiple complexes, consisting of one or more layers of paper, cellophane, aluminum foil and a very large range of synthetic plastics films, such as polyethylene, polypropylene, polyester, polyamides, PBC, PVDC, surlyn, polystyrene, with the different layers being bonded together with adhesive, lacquer, synthetic plastics material, wax, hot melt and the like.

In certain types of containers, it may be desirable to provide score lines on both sides of the web of packaging material. According to the present invention, this can be attained by means of a laser beam of adjustable intensity, operative on each side of the web of packaging material, each laser beam being steered by pattern-dependent signals in two mutually perpendicular directions.

The method according to the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic view of the device suitable for applying the method;

Fig. 2-8 show examples of containers provided with score lines.

Fig. 1 shows a device for applying the method according to the present invention, wherein a roll 1 of packaging material 2 with a recurrent printed pattern is passed through the device for providing score lines on one or possibly two sides, which score lines should naturally be in register with the printed pattern provided on the web of packaging material 2. After providing score lines, the web of material 2 is wound on a roll 3, from which separate containers are cut, with further operations such as filling, sealing, etc.

The web of material 2 is conducted along a first scanner 9 and possibly along a second scanner 10 by means of a plurality of deflector rolls 4-8. Scanners 9, 10 are fed with a laser beam from a laser source 11, scanners 9, 10 are fitted with so-called flying optics, lenses and focus correction, providing for the possibility of moving the laser beam over the advancing web of material 2 in two mutually perpendicular directions X, Y and at adjustable intensity. The movement of the laser beam in the X or Y direction is controlled from a control device 12, transmitting control signals to the flying optics and the focus correction of scanner 9 and possibly also to scanner 10. These control signals are generated in control device 12 on the basis of the desired configuration of the score line, which is entered into control device 12 by means of a

programming unit 13. Naturally, the control signals should also be related to the advancing speed of the web of material 2, which speed is measured with a suitable transducer 14, whose output signal is applied to the control device 12. As the score line to be provided has to be brought into register with the printing pattern of the web of material 2, there is provided a scanning eye 15 for scanning the printing pattern, said eye 15 being electrically connected to control device 12.

Scanner 10 for providing a score line possibly at the rear of the web of material 2 can be fed from the laser source 11 by means of a beam splitting mirror 16 and a stationary mirror 17. It is also possible to provide, at the location of the beam splitting mirror 16, a swivelling mirror which is moved under the control of control device 12 at such a frequency that the score lines are formed alternately at the front and the back of the web of material 2.

For the purpose of adjusting the score lines made by the scanner 10, at different pattern lengths of the printed pattern, to a given pattern length, there is provided a tensioning roller 18 between deflector rolls 5, 6, which roller 18 is movable, under the control of control device 12, by means of a motor 19 in such a manner that the loop 20 formed in the web of material 2 by the tensioning roller is adjusted to the pattern length.

Examples of packaging materials and score lines provided therein will be described in more detail hereinafter.

Example 1 (Figs. 2-3)

Fig. 2a shows a sachet 20 containing a dried product for soups, sauces and the like, and provided in the right-hand corner with a score line 21, which may have a continuous or a discontinuous form. In the flat position (Fig. 2b) the width of the container is equal to the roll width. Score line 21 has approximately the form of a semi-ellipse. The composition of the packaging material is as follows:
- 0.0125 mm polypropylene (11 g/m²)
- 2 g/m² lacquer
-60 g/m² coated kraft paper
- 1 to 1.5 g/m² adhesive
- 0.008 mm aluminum foil (21.6 g/m²)
- 2 g/m² lacquer
- 0.025 mm LD polyethylene (24 g/m²).

For the purpose of forming a score line, the entire outer film (polypropylene) and part of the subjacent paper are evaporated according to the selected pattern. The intermediate aluminum foil remains entirely intact and gives shelf life to the contents of the container.

With broader rolls of packaging material, as shown in Fig. 3a, three parallel, identically moved laser beams are provided for simultaneously forming three juxtaposed score lines 21. Figs. 3b-d show alternative forms of score line 21. Their configuration is determined on the one hand by aesthetical considerations and on the other hand by the wish to be able to dose the contents of the container uniformly.

Example 2 (Figs. 4-5)

The composition of the packaging material for the coffee package shown in Figs. 3-4 is as follows:
- 0.021 mm polypropylene (19 g/m²)
- 2 g/m² lacquer
- 50 g/m² coated kraft paper.

The synthetic plastics film of this laminate cannot be torn without scissors or knife. Owing to the score line 21 formed down to the paper, the container can be opened easily and the coupon removed. In this case, too, the width of the spread container may be equal to the roll width (Fig. 4) or considerably narrower, so that a plurality of containers are located in side-by-side position (Fig. 5).

Example 3 (Fig. 6)

The container shown in Fig. 6 consists of a single layer of polypropylene of 30-35 µ (about 27 or 32 g/m²). This single synthetic plastics film is evaporated partly at the score line 21 and can then be torn off easily along the score line.

Example 4 (Figs. 7-8)

The cigar container shown in Figs. 7 and 8 consists of a box 22 of cardboard, wherein a bag 23 is glued. Bag 23 is formed from a non-printed web of material of the following composition:
- 28 g/m² polyester
- 13 g/m² polyethylene
- 7 µ aluminum foil (18.9 g/m²)
- 18 g/m² polyethylene.

The outermost polyester layer cannot be torn. By providing the score lines 21 in the two outside synthetic plastics films, it becomes possible for the intermediate portion to be opened when box 22 is opened, because the rim 24 of bag 23 is adhered to the tab 25 of box 22. Rim 24 is connected at the opposite side by a ribbon of adhesive 26 to the subjacent frontof bag 23. The score lines 21 are provided in the web of material 2 according to a fixed pattern of a given strike-off length.

The aluminum foil and the subjacent polyethylene remain unaffected by the score lines 21, so

that the aroma of the cigars continues to be present so long as the container 22, 23 is not opened.

The bag-in-box package shown in Fig. 8 differs from that shown in Fig. 7 only in that the bag 23 is sealed in another place by a sealing seam 27. Score lines 21 in this case do not continue as far as the turned down rim of the packaging material but terminate in the "full" material near the point P. To ensure the proper opening of bag 23 by means of tab 25 of box 22, the ends of the score lines 21 should be interconnected by a horizontal score line 28, to be provided both at the front and at the back of the web of material 2. Naturally, here too, tab 25 is connected near score line 28 to bag 23 by means of gluing.

In the event of long score lines or lines of weakness of complicated configuration, it may be desirable to split the lines into parts which are each provided in the web of material with a separately controllable laser beam. In the device shown diagrammatically in Fig. 1, two laser beams with associated scanners 9 should then be available on the same side of the web of material 2, while naturally control device 12 should be adapted for the independent control of the two scanners 9.

Claims

1. A method of providing score lines in packaging material by local evaporation by means of a laser beam, said laser beam and said packaging material being relatively movable, characterized in that the score lines are provided in a recurring pattern on at least one side of a web of packaging material advancing at uniform, adjustable speed, the intensity of said laser beam being adjustable and said laser beam being moved in two mutually perpendicular directions under the control of pattern dependent signals.

2. A method as claimed in claim 1, characterized in that score lines are produced on opposite sides of the weblike packaging material by means of two laser beams operating on opposite sides of the web of packaging material, the intensity of said beams being adjustable, each beam being movable in two mutually perpendicular directions under the control of pattern-dependent signals, and the score lines provided on the one side are at least partly in registry with the score lines provided on the other side.

3. A method as claimed in either of claims 1-2, characterized in that a score line is provided by means of at least two independently laser beams of adjustable intensity, each covering contiguous parts of the score line.

FIG.1

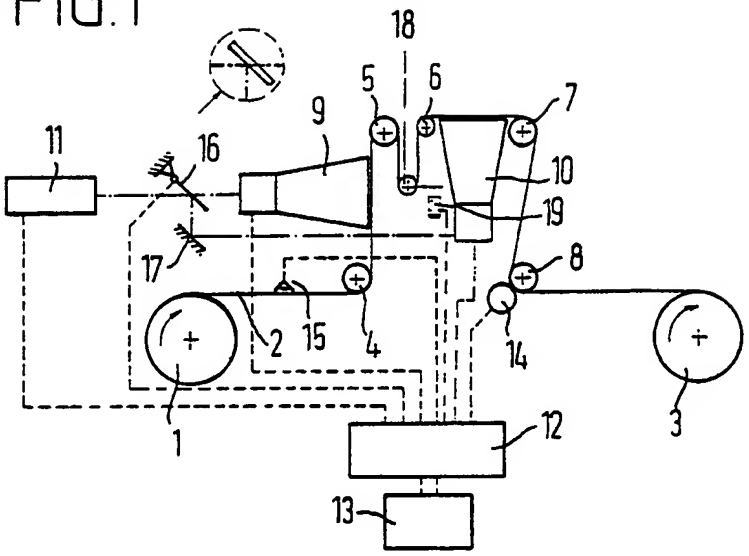


FIG.2

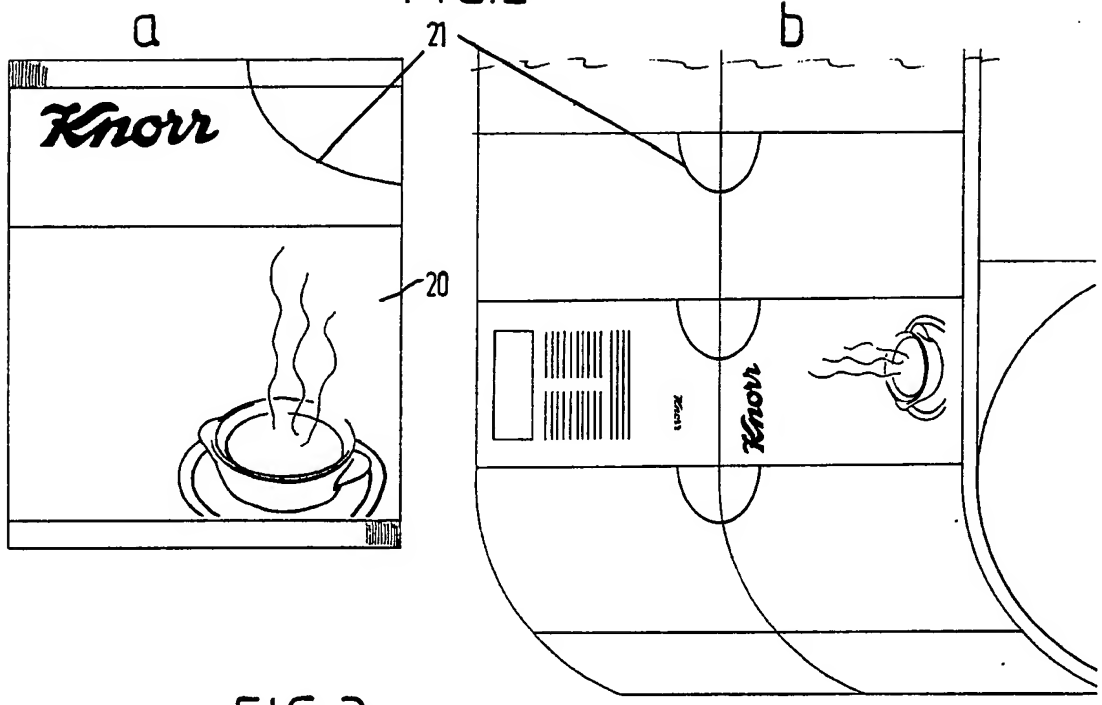


FIG.3

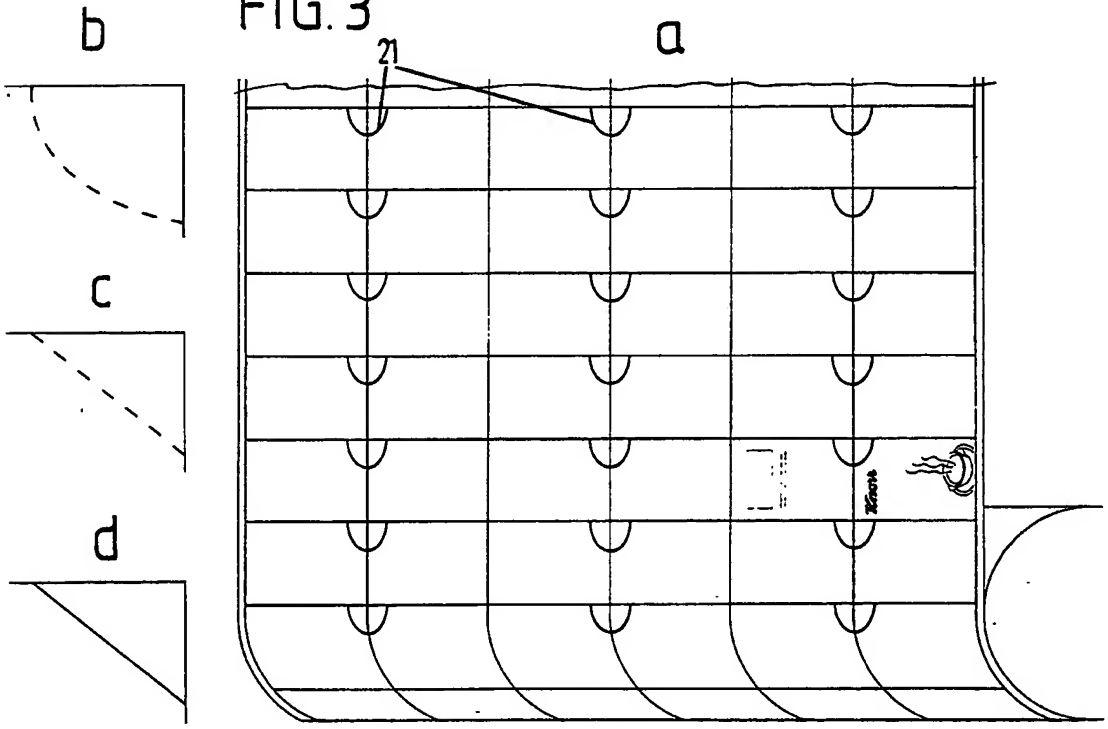


FIG.4

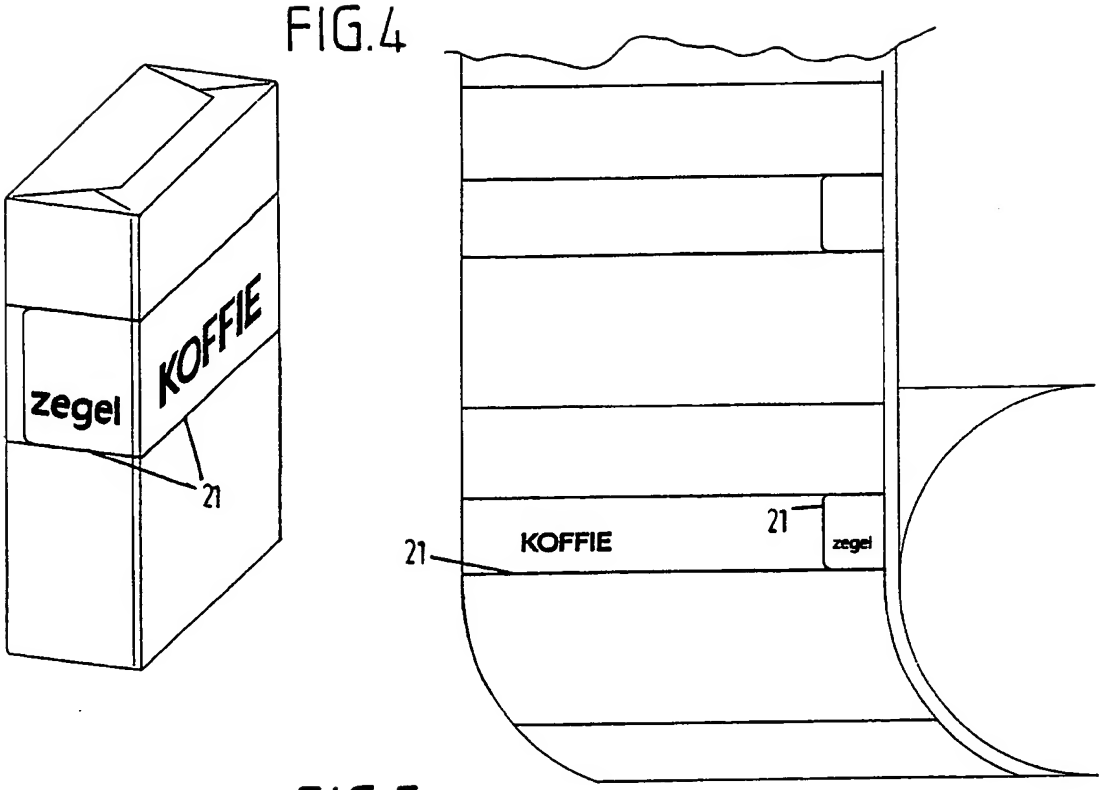


FIG.5

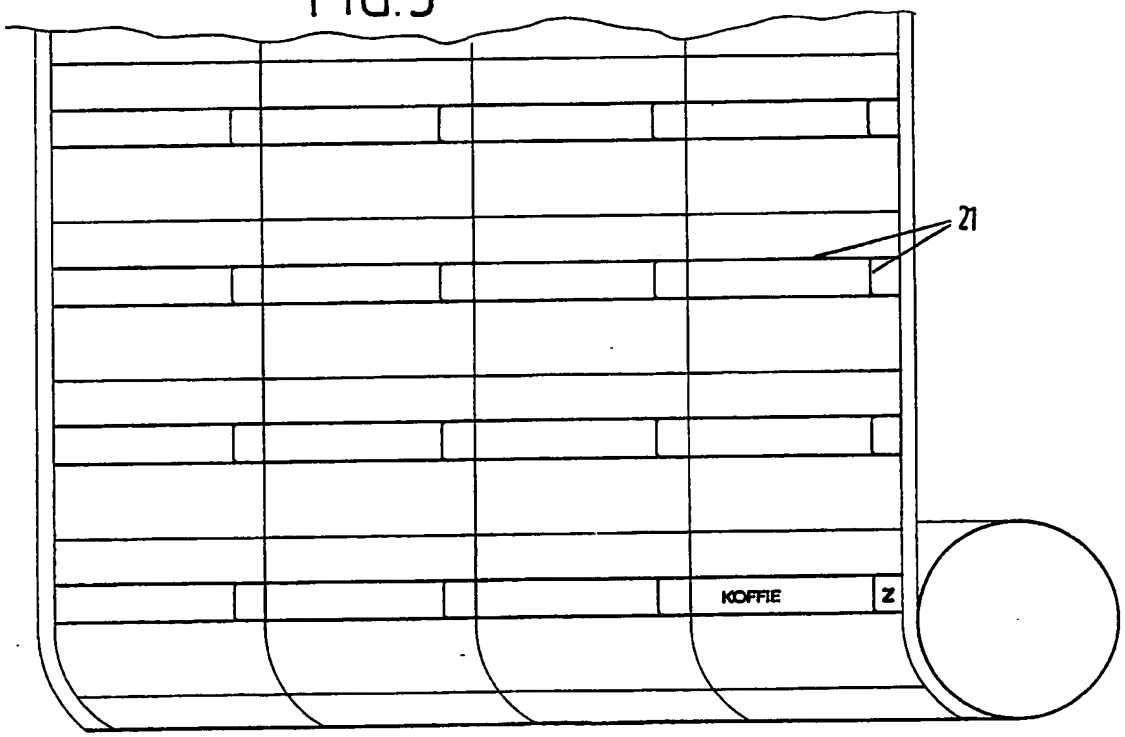
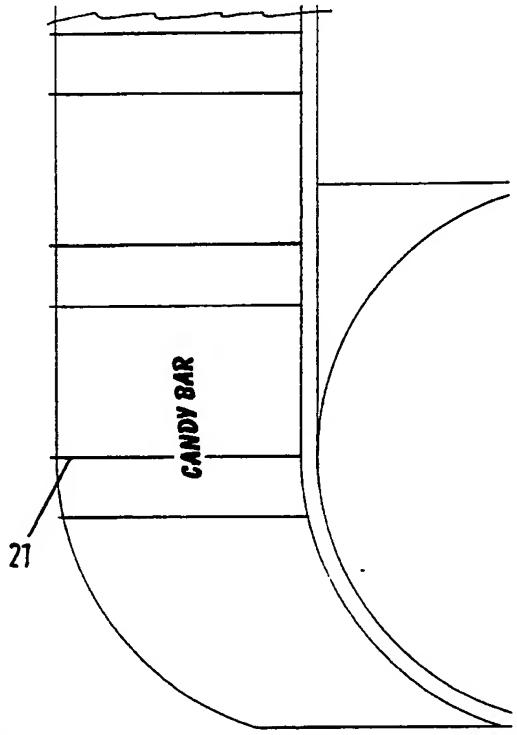


FIG.6



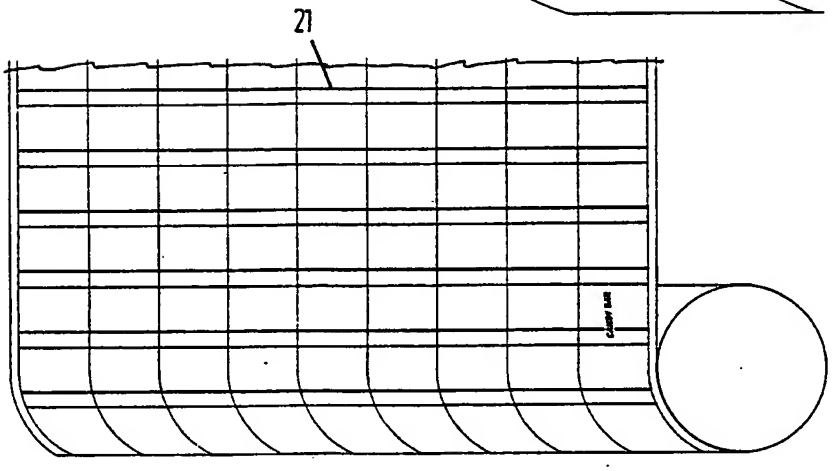
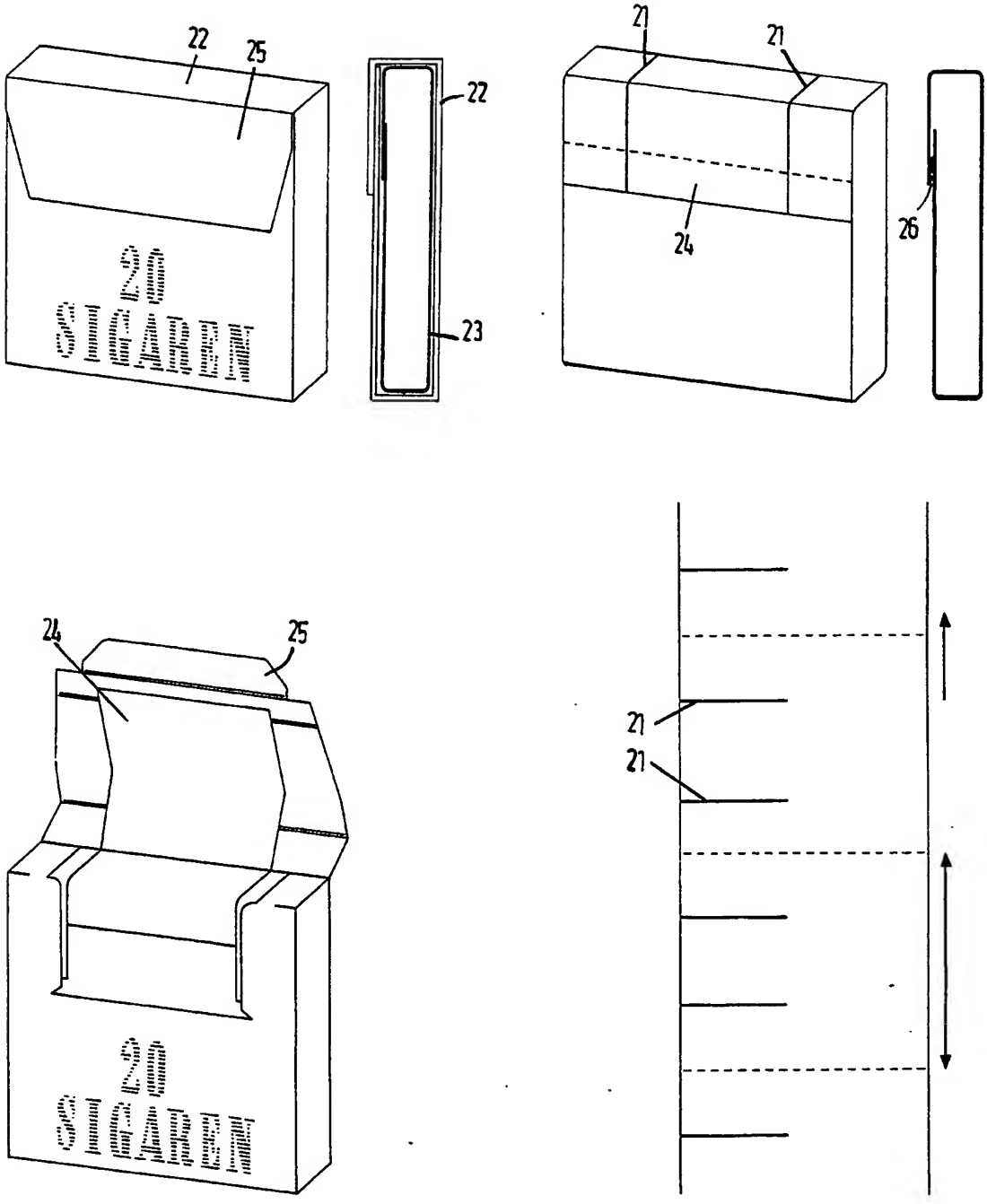


FIG.7



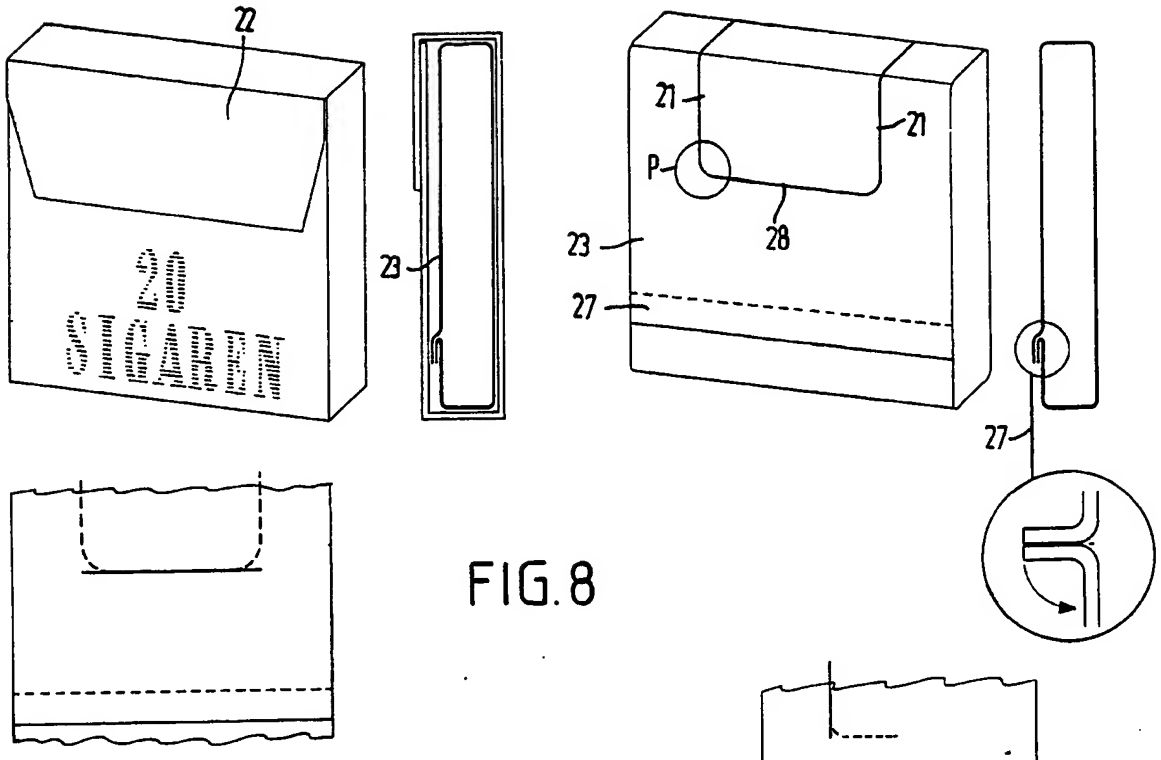
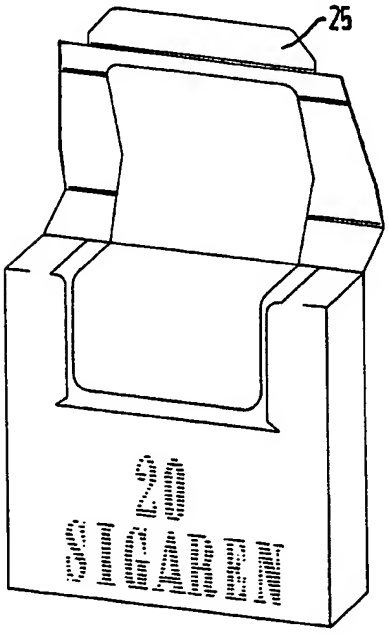
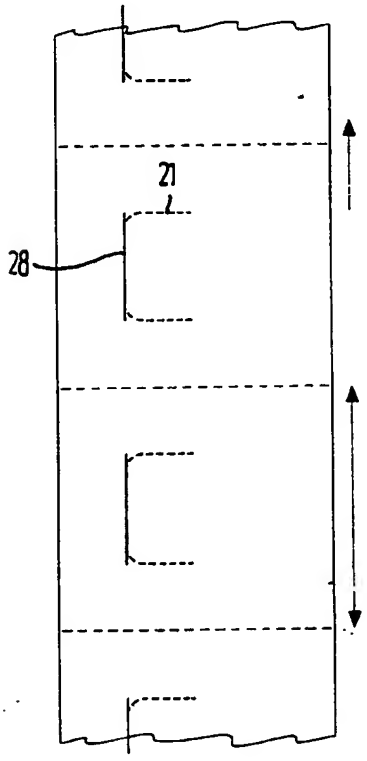


FIG.8





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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
X	US-A-4 356 377 (J.F. NORTON) * Abstract; figures *	1-3	B 29 C 53/06 B 31 B 1/25 B 23 K 26/00
X	FR-A-2 576 836 (DUPUY) * Page 2, lines 25-37 *	1-3	
X	US-A-3 626 143 (F.H. FRY) * Abstract; column 2, lines 29-35 *	1-3	
D,X	US-A-3 909 582 (W.E. BOWDEN) * Column 1, lines 52-56 *	1-3	
X	GB-A-2 020 592 (OWENS-ILLINOIS) * Figures; page 1, lines 5-85; page 2, line 129 - page 3, line 4; claim 3 *	1-3	
X	US-A-4 160 894 (STEMMLER) * Figures; abstract; column 6, lines 1-7 *	1-3	
X	DE-A-3 447 405 (HEYDEN) * Figures; page 5, line 28 - page 6, line 7 *	1-3	TECHNICAL FIELDS SEARCHED (Int. Cl.3) B 29 C B 23 K
X	US-A-4 049 945 (EHLSCHEID) * Figures; column 3, lines 22-28 *	1-3	
A	US-A-4 671 848 (MILLER) * Figures *	1-3	
A	FR-A-1 500 197 (WINDMOLLER & HOLSCHER) * Figure 5 *	2	
A	US-A-4 224 096 (OSBORNE) * Figures *	2	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-05-1989	CORDENIER J.

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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.3)
A	US-A-4 322 601 (SERLIN) * Figure 13; column 7, lines 2-25 *	3	
A	PATENT ABSTRACTS OF JAPAN, vol. 10, no. 18 (M-448)[2075], 24th January 1986; & JP-A-60 177 984 (KOGYO GIJUTSUN (JAPAN)) 11-09-1985	1	
D,A	GB-A-2 161 427 (AMALGAMATED MINING) * Page 2, lines 71-124 *	1	
A	WO-A-8 700 121 (AVERY INT. CORP.) * Figures * & US-A-4 549 063 (Cat. D)	1	
A	DE-A-2 612 194 (BIO-DYNAMICS) * Figure 1, ref. 12; figure 3 *	1	
A	US-A-4 356 375 (JOSEPHY) * Figures; abstract *	1	
A	US-A-3 597 578 (SULLIVAN) * Figures; abstract *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.3)

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THE HAGUE	17-05-1989	CORDENIER J.

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